CLAIMS

1. An optical cross connect switch, comprising:

a beam generating portion receiving an optical input fiber having an end, and providing an optical signal from said end, and having a means for generating a substantially collimated communication beam containing said optical signal, and a means for generating a substantially collimated companion alignment beam, wherein said communication beam and said companion alignment beam propagate away from said beam generating portion in closely spaced, substantially parallel paths;

a beam receiving portion receiving a plurality of optical output fibers, each said optical output fiber having a core and an associated position sensor adjacent and in a known positional relationship to said core;

a beam directing portion for receiving said communication beam and said companion alignment beam from said beam generating portion, and a means for directing said communication beam to one optical output fiber of said plurality of optical output fibers, and said companion alignment beam to said associated position sensor wherein said companion alignment beam strikes said position sensor at a location and said sensor generates an electrical signal corresponding to said location; and

a means for controlling said means for directing said communication

beam, said means for controlling receiving said electrical signal and adjusting said means for directing said communication beam in response to said electrical signal to position said communication beam on said core.

2. The optical cross connect switch of claim 1, wherein said companion alignment beam is unmodulated.

3. The optical cross connect switch of claim 1, wherein said beam generating portion further comprises a substrate formed with a fiber alignment hole for receiving said optical input fiber.

4. The optical cross connect switch of claim 1, wherein said means for generating a substantially collimated communication beam includes a lenslet positioned a distance from said end of said optical fiber wherein said optical signal passes through said lenslet.

5. The optical cross connect switch of claim 4, wherein said lenslet is formed with a focal distance, and said distance from said end of said optical fiber is approximately equal to said focal distance.

6. The optical cross connect switch of claim 1, wherein said beam receiving portion further comprises a substrate formed with a fiber alignment hole for receiving each fiber of said plurality of fibers.

7. The optical cross connect switch of claim 1, wherein said beam directing portion further comprises a first beam director formed with a steerable beam directing element having a reflective surface, and a second beam director formed with a plurality of steerable beam directing elements having a reflective surface, said communication beam striking said reflective surface of said first beam director for reflection to one of said plurality of beam directing elements in said second beam director for reflection to said core of one said output fiber, and said companion alignment beam striking said reflective surface of said first beam director for reflection to said one of said plurality of beam directing elements in said second beam director for reflection to said associated position sensor.

8. The optical cross connect switch of claim 1, wherein said means for controlling said means for directing further comprises a control system comprising a processor having an input for receiving switching information, and an output generating a control signal for said means for directing said

communication beam to said core of said output fiber.

9. The optical cross connect switch of claim 8, wherein said control system receives said electrical signal corresponding to said location and determines an optical feedback position error, and generates a second control signal for said means for directing said communication beam to said core of said output fiber.

10. The optical cross connect switch of claim 1, wherein said beam receiving portion further comprises a lenslet positioned a distance from said end of each said optical fiber wherein said optical signal passes through said lenslet.

11. The optical cross connect switch of claim 10, wherein said lenslet is formed with a focal distance, and said distance from said end of said optical fiber is approximately equal to said focal distance.

12. An optical cross connect switch comprising:

a beam generating portion generating a communication beam and an alignment beam wherein said communication beam and said alignment beam

propagate away from said beam generating portion in closely spaced paths;

a beam receiving portion having at least two output fibers, each output fiber formed with a core and having an associated position sensor in a known position relative to said core;

a beam directing portion positionable to direct said communication beam to said core of one said output fiber of said at least two output fibers, and said alignment beam to a location on said associated position sensor, wherein said associated position sensor generates a position signal corresponding to said location; and

a controller receiving said position signal and generating an optical feedback control signal, wherein said beam directing portion receives said optical feedback control signal and adjusts said beam directing portion to position said communication beam on said core.

13. The optical cross connect switch of claim 12, wherein said beam generating portion further comprises a substrate formed with a fiber alignment hole for receiving an optical fiber having an end and retaining said end of said optical fiber in a known location relative to said alignment beam, wherein said communication beam propagates from said end of said optical fiber.

14. The optical cross connect switch of claim 13, wherein said beam generating portion further comprises a panel formed with a lenslet, said lenslet positioned adjacent said end of said optical fiber to collimate said communication beam.

15. The optical cross connect switch of claim 13, wherein said beam generating portion further comprises a panel formed with a lenslet positioned in said alignment beam to collimate said alignment beam.

16. The optical cross connect switch of claim 15, wherein said paths of said communication beam and said alignment beam are substantially parallel.

17. The optical cross connect switch of claim 12, wherein said paths of said communication beam and said alignment beam are parallel.

18. The optical cross connect switch of claim 12, wherein said paths of said communication beam and said alignment beam are converging.

19. The optical cross connect switch of claim 18, wherein said beam

generating portion and said beam receiving portion are separated by an optical path having a length, and wherein said communication beam and said alignment beam cross approximately midway along said optical path.

20. The optical cross connect switch of claim 12, wherein said paths of said communication beam and said alignment beam are coaxial.

21. The optical cross connect switch of claim 12, wherein said beam receiving portion further comprises a substrate formed with a plurality of fiber alignment holes, one said fiber alignment hole for receiving each said optical fiber and positioning said core of said optical fiber.

22. The optical cross connect switch of claim 19, wherein said beam receiving portion further comprises a panel separated from said end of said fiber by a distance, and having a lenslet positioned in said communication beam wherein said communication beam passes through said lenslet.

23. The optical cross connect switch of claim 22, wherein said lenslet has a focal length, and said focal length is approximately equal said distance wherein said communication beam focusses on said core.

24. The optical cross connect switch of claim 21, wherein said beam receiving portion further comprises a panel separated from said position sensor by a distance, and having a lenslet position in said alignment beam wherein said alignment beam passes through said lenslet.

25. The optical cross connect switch of claim 24, wherein said lenslet has a focal length, and said focal length is approximately equal said distance wherein said alignment beam focusses on said sensor to form a spot.

26. The optical cross connect switch of claim 12, wherein said position sensor of said beam receiving portion further comprises a plurality of light sensing elements.

27. The optical cross connect switch of claim 26, wherein said position sensor further comprises a CMOS sensor.

28. The optical cross connect switch of claim 12, wherein said position sensor further comprises a position sensitive diode.

29. The optical cross connect switch of claim 12, wherein said beam directing portion further comprises an interface for receiving switching information from a telecommunication system, said switching information further comprises the specification of a input fiber, and the specification of a target output fiber.

30. The optical cross connect switch of claim 29, wherein said beam directing portion further comprises a means for directing said communication beam and said alignment beam to said target output fiber.

31. The optical cross connect switch of claim 30, wherein said means for directing further comprises a micro electromechanical system (MEMS) device.

32. The optical cross connect switch of claim 30, wherein said means for directing further comprises a movable mirror.

33. The optical cross connect switch of claim 30, wherein said means for directing further comprises a first panel and a second panel, said first panel

formed with a beam director, and said second panel formed with a plurality of beam directors, one said beam director corresponding to each said output fiber, wherein said communication beam and said alignment beam propagate from said beam director of said first panel to one said beam director of said second panel and to said core of said output fiber.

34. The optical cross connect switch of claim 33, wherein each output fiber has an optical axis, and said corresponding beam director of said plurality of beam directors is positioned along said optical axis.

35. The optical cross connect switch of claim 33, wherein said beam director portion further comprises a turning mirror surface optically positioned between said first panel and said second panel wherein said communication beam and said alignment beam propagate from said directing element of said first panel to said turning mirror and to said beam directing element of said second panel.

36. The optical cross connect switch of claim 12, wherein said beam generating portion further comprises a substrate formed with a fiber alignment hole for receiving an optical fiber having an end and retaining said

end of said optical fiber in a known location relative to said communication beam, wherein said alignment beam propagates from said end of said optical fiber.

37. The optical cross connect switch of claim 12, wherein said beam generating portion further comprises a LED generating illumination, wherein said illumination forms said alignment beam and propagates from said beam generating portion.

38. The optical cross connect switch of claim 37, wherein said beam generating portion further comprises a mask formed with a hole and positioned on said LED wherein said illumination is masked to form said alignment beam.

39. The optical cross connect switch of claim 37, wherein said beam generating portion further comprises a substrate formed with a lenslet positioned in said alignment beam to collimate said alignment beam.